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(54) Title: SHELF STABLE DAIRY PRODUCTS		
(57) Abstract Shelf stable dairy products including cream cheese filling are disclosed which can be prepared by combining cream cheese with a freezing point depressant to lower A_w to below about 0.91. The dairy products may also comprise a preservative and an acidulant. The dairy products of the invention may be held shelf stable for extended periods of time. The invention is directed to dairy products such as the disclosed cream cheese filling composition, method of preparation and food products containing the cream cheese filling.		

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SHELF STABLE DAIRY PRODUCTS

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Field of the Invention

The invention relates generally to shelf stable dairy products and methods of producing the same. More

5 specifically, the invention is directed to dairy products including cheeses and methods of stabilizing these products against spoilage for extended periods of time.

Background of the Invention

10 Shelf stable food fillings are well known. Shelf stable food fillings have been developed for several different types of food, including chicken, beef, and fruit. For example, Lee et al., U.S. Patent No. 5,059,433 disclose a shelf stable filling material with a water
15 activity (A_w) of less than 0.85. The filling materials have a moisture content below 28% by weight. The filling components are mixed at room temperature, cooled down to a temperature below about 60°F and kept refrigerated prior to use.

20 Wallin et al., U.S. Patent Nos. 4,623,542 and 4,612,198 disclose a shelf stable flavored filling material.

Viscosity and pH are controlled to provide a filling formula which gives a high product quality, high moisture content, one of good shelf stability and product stability.

25 Kingham et al., U.S. Patent No. 4,721,622 disclose a shelf stable, filled food product wherein the filling has a water

activity range (A_w) between 0.20 to 0.99. Bernotavicz, U.S. Patent No. 3,922,353 discloses a shelf stable meat containing filling with a moisture content of at least about 50% by weight with an A_w of at least about 0.90.

- 5 Ramet, French Patent No. 2,610,795 discloses preserving food with an aqueous solution of salt, polyols, and sugar. The pH is adjusted to 3 to 5.5, and the A_w is between 0.60 and 0.85.

- However, there is a need to develop shelf stable dairy products such as cream cheese fillings. Known cheese fillings generally are not shelf stable, and therefore, must be either refrigerated or aseptically packaged in order to prevent spoilage. For example, see Lee et al., U.S. Patent No. 5,057,433 issued October 22, 1991.
- 10 Further, the prior art preservation methods are generally costly and time demanding. Further, refrigerated storage and transportation may also be necessary to avoid spoilage and fully utilize the dairy products. This requires substantial capital and storage costs. Furthermore, these
- 15 known cheese fillings are sensitive ingredients once they are unpackaged, and will spoil rapidly if they are not used. Thus, a substantial need exists for shelf stable dairy products as well as methods for providing the same.

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Summary of the Invention

In accordance with a first aspect of the invention

there is provided a shelf stable dairy product including an amount of a freezing point depressant effective to lower A_w to less than about 0.91 and water. A preservative and an acidulant can optionally be added to lower the pH to about 5 2 to 5 and protect the dairy product against microbial growth. The present invention is directed to a food product comprising a shelf stable dairy product of the present invention. Examples of such food products include bakery products, specifically, pastries, doughnuts, bagels, 10 danishes, turnovers and toaster strudel.

In accordance with a preferred aspect of the invention, there is provided a shelf stable cheese which includes a cream cheese, a humectant, a physical stabilizer, and water. The physical stabilizer may comprise a cellulose 15 compound and one or more compounds selected from the group consisting of starch, xanthan gum, locust bean gum and guar gum.

The invention is also directed to a method of preserving a dairy product by mixing the dairy product with 20 an amount of a freezing point depressant effective to lower A_w to less than about 0.91.

The invention provides shelf stable dairy products. The shelf stable dairy product can be stored under ambient conditions for periods up to about 8 weeks. This 25 eliminates the need for refrigerated storage and refrigerated transportation of the dairy product.

Additionally, the dairy product of the invention eliminates the need for additional manufacturing procedures that are necessary to handle sensitive ingredients, which are ingredients known to be a potential source of a microbial hazard. Thus, the dairy product of the present invention reduces costs substantially, and adds increased flexibility to the manufacturing of food products which incorporate the dairy product.

10 Detailed Description of the Invention

The invention is directed to shelf stable dairy products including an amount of a freezing point depressant effective to lower A_w to less than about 0.91 and water. Optional ingredients include a preservative, an acidulant to lower the pH to about 2 to 5 and a physical stabilizer.

A. Dairy Product

The invention is directed to the preservation of dairy products. Generally, dairy products spoil from yeast and mold growth. Yeast and mold may grow in the dairy products because of the typically high water activity ($A_w = 0.91$ and above) in dairy products. Dairy products add flavor, texture, mouthfeel, and nutritional value, among other qualities, to any given food product in which they are incorporated.

25 Generally, the dairy products of the invention comprise milk or other dairy sources of proteins. Dairy proteins

and products may tend to spoil or otherwise become unacceptable food products through curdling (protein agglomeration and fall out) as well as yeast and mold growth on the dairy product. While curdling may be desirable in certain food products (e.g. cheeses), it may also be undesirable in certain products (e.g. milks). Examples of suitable dairy products are butter, cheese, cream cheese, milk, buttermilk, ice cream and cream. In one preferred aspect, the invention is directed to a cheese, and most specifically to a cream cheese.

Cream cheese is a soft unripened cheese made from milk and cream. The milk and cream mixture is homogenized, pasteurized, cooled to about 80°F and set. In a typical embodiment, the cream cheese has less than 55% water by weight and more than 33% milk fat.

The weight percentage of dairy product used in the shelf stable dairy product can be about 10 to 80% by weight based on the total weight of the shelf stable dairy product. Preferably, the amount of the dairy product is about 20 to 70% by weight. More preferably, the amount of the dairy product is about 50 to 70% by weight. Most preferably, the amount of the dairy product in the shelf stable filling is about 60 to 67% by weight.

B. Lowering Water Activity

In general, the amount of water in the shelf stable dairy product is about 32 to 41% by weight of the shelf

stable dairy product. Preferably, this amount of water in the shelf stable dairy product is about 35 to 38%.

The composition of the invention may also comprise any composition which lowers water activity, (A_w). A_w is a
5 measure in a system of the unbound free water available to support biological and chemical reactions. One measure of water activity is $(A_w) = (p/p_0)$, where p is the vapor pressure of water in the system (the shelf stable dairy product) and p_0 is the vapor pressure of pure water at the
10 same temperature. Lowering A_w restricts the growth of bacteria and is accomplished by lowering p , the vapor pressure of water in the dairy product. P may be depressed by including sufficient amounts of a freezing point depressant in the dairy product. The drop in p is in
15 accordance with Raoult's Law which states that $p = (A_w) * (p_0)$, where A_w is also the ratio of moles of freezing point depressant over the sum of moles of constituents in the shelf stable dairy product. Most bacteria of concern in food preservation require A_w values of greater than 0.90 to
20 grow. Thus, lowering A_w to below 0.91 prevents most kinds of bacteria from growing in the dairy product.

A freezing point depressant is used to lower the water activity (A_w) of the filling to below about 0.91. The freezing point depressant is generally a humectant. The
25 humectant can be selected from, but is not limited to an alcohol, a saccharide, a gum, a salt and mixtures thereof.

Preferably, the humectant is selected from the group consisting of a monohydric alcohol, a diol, a polyol; a monosaccharide, a disaccharide, a trisaccharide, salt thereof and mixtures thereof. More preferably, the

5 humectant is selected from the group consisting of glycerol, fructose, sucrose, glucose, propylene glycol, sodium chloride, sorbitol, mannitol, polydextrose, carboxymethyl cellulose, guar gum, molasses, potassium polymetaphosphate, triacetin, propionate, sodium lactate,

10 monosodium glutamate, corn syrup, glycine, 1,2-propanediol, alginate and mixtures thereof.

The freezing point depressant lowers the A_w to between about 0.75 to 0.91, and more preferably, A_w is lowered to about 0.80 to 0.89 for the composition.

15 Preferably, the amount of the freezing point depressant is about 10 to 75% by weight of the shelf stable dairy product. More preferably, the amount of the freezing point depressant is about 25 to 65% by weight. More preferably, the amount of the freezing point depressant is about 29 to

20 50% by weight.

Preferably, the freezing point depressant comprises about 2 to 10% by weight of glycerine based on the total weight of the dairy product. More preferably, the freezing point depressant comprises a mixture of about 2 to 10% by

25 weight glycerine, 10 to 50% by weight fructose and 0 to 50% by weight sucrose based on the total weight of the shelf

stable dairy product. In a preferred embodiment the ratio of salt to sugar in the freezing point depressant is balanced to achieve a desirable taste that is not salty. Preferably, the cheese filling comprises less than about 1% by weight of the salt.

As an example, in a typical cream cheese, the normal freezing point is about -18°C . A shelf stable cream cheese of the invention has a freezing point of below about -30°C . More preferably, the freezing point of the shelf stable cream cheese is below about -35°C .

The total amount of the dairy product in the shelf stable dairy product is important when selecting the freezing point depressant. If the given product has at least about 50% by weight dairy product or more, the freezing point depressant should comprise glycerine. Preferably, the shelf stable dairy product comprises about 2-10% by weight glycerine when the shelf stable dairy product has at least about 50% by weight dairy product. Glycerine is generally a more potent freezing point depressant than simple sugars, and when the amount of dairy product in the filling exceeds 50% by weight, simple sugars alone are insufficient to reduce A_w to below 0.91.

C. Stabilizer

A physical stabilizer is added to the shelf stable dairy product of the present invention to increase viscosity, provide stability to high heat, high shear,

frozen temperatures and acidity. In addition, the physical stabilizer provides freeze/thaw stability and provides a smooth texture.

Generally, the amount of the physical stabilizer is about 1 to 10% by weight of the shelf stable dairy product. Preferably, the amount of the physical stabilizer is about 2 to 8% by weight. More preferably, the amount of the physical stabilizer is 2 to 5% by weight.

Generally, the physical stabilizer can be a gum, a cellulose compound, a starch, and mixtures thereof. Specifically, the gums are selected from the group consisting of xanthan gum, locust bean gum, guar gum and mixtures thereof. The gum mixture provides stability to heat, high shear, acidity and freeze thaw. Preferably, the gum mixture comprises about 40 to 60% by weight xanthan gum, about 25 to 40% by weight locust bean gum and about 10 to 25% by weight guar gum.

The preferred starch is a cold water swelling starch which can be Ultra-sperse starch from National Company. The starch increases viscosity and adds heat, acid and shear stability. In a typical environment of the present invention, the gum mixture comprises about 0.1 to 0.5% by weight of the total shelf stable dairy product weight, and the starch about 1 to 7.5% by weight. In one embodiment, the gum mixture will comprise 0.2 to 0.4% by weight of the shelf stable dairy product, and the starch will comprise

about 1 to 3% by weight.

In a preferred embodiment, the physical stabilizer further comprises a cellulose compound. The cellulose compound prevents liquid separation in the shelf stable dairy product. The cellulose compound can be selected from the group consisting of carboxymethyl cellulose, carboxyethyl cellulose, carboxypropyl cellulose, and mixtures thereof. Preferably, there is about 0.1 to 0.5% by weight of carboxymethyl cellulose in the shelf stable dairy product. More preferably, the amount of the carboxymethyl cellulose is about 0.2 to 0.4% by weight. Most preferably, the amount of the carboxymethyl cellulose is about 0.3% by weight in the shelf stable dairy product.

D. Acidulants

An acidulant is utilized in the shelf stable dairy product to adjust the pH level to about 2 to 5. The pH is lowered in the dairy product to obtain the optimum preserving activity from the preservative. Generally, the pH is adjusted to about the pKa level of the preservative. Preferably, the pH level is adjusted to about 3.0 to 4.5. More preferably, the pH level is adjusted to about 3.5 to 4.0.

Generally, the acidulant can be any food grade acid. Specifically, the acidulant can be selected from the group consisting of phosphoric acid, sulfuric acid, adipic acid, tartaric acid, succinic acid, acetic acid, fumaric acid,

propionic acid, citric acid, malic acid, lactic acid and mixtures thereof. Preferably, the acidulant is citric acid.

Preferably, the amount of the acidulant in the shelf
5 stable dairy product is about 0.15 to 0.85% by weight. More preferably, the amount of the acidulant is about 0.20 to 0.65% by weight. Most preferably, the amount of the acidulant is about 0.20 to 0.45% by weight.

E. Preservatives

- 10 The invention may also comprise a preservative. Generally, a preservative protects against bacterial growth in a dairy product. The preservative acts as a yeast-mold inhibitor in the shelf stable dairy product. Generally, the preservative can be any food grade preservative.
- 15 Specifically, the preservative can be selected from the group consisting of sorbic acid, potassium sorbate, sodium sorbate, sodium propionate, calcium propionate, sodium benzoate, calcium benzoate, mixtures thereof, and other commercially available inhibitors commonly used in foods.
- 20 Preferably, the preservative is sorbic acid or potassium sorbate.

Preferably, the amount of the preservative is about 0.05 to 0.35% by weight of the shelf stable dairy product. More preferably, the amount of the preservative is about
25 0.07 to 0.25% by weight. Most preferably, the amount of the preservative is about 0.075 to 0.15% by weight.

Table 1 (wt-%)

	<u>Useful</u>	<u>Working</u>	<u>Preferred</u>
5 Cream Cheese	10-80	20-70	60-67
Freezing Point- Depressant	10-75	25-65	29-50
10 A_w	0.6-0.91	0.75-0.91	0.8-0.89
Stabilizer	1-10	2-8	2-5
Acidulant	0.15-0.85	0.2-0.65	0.25-0.45
15 Preservative	0.05-0.35	0.07-0.25	0.075-0.15
pH	2-5	3.0-4.5	3.5-4.0

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Methods of Preservation

The invention is also directed to a method for preserving a dairy product. To prepare a shelf stable dairy product of the present invention, a dairy product is
 25 mixed with an amount of a freezing point depressant effective to lower A_w to below 0.91, and optionally, an effective preserving amount of a preservative and an acidulant to adjust the pH to about 2 to 5. Preferably, the freezing point depressant comprises about 2-10% by
 30 weight glycerine based on the total weight of the shelf stable dairy product. Optionally, the method of preserving the dairy product can further comprise contacting the dairy product with a physical stabilizer. Preferably, the physical stabilizer comprises about 0.1-0.5% by weight of a
 35 cellulose compound and about 1.5 to 7.9% by weight of one or more stabilizers selected from the group consisting of

starch, xanthan gum, locust bean gum, and guar gum. More preferably, the cellulose compound is selected from the group consisting of carboxymethyl cellulose, carboxyethyl cellulose, and carboxypropyl cellulose. In a preferred
 5 embodiment, the cellulose compound is carboxymethyl cellulose.

The invention is also directed to the preparation of a food product comprising the shelf stable dairy product of the present invention. Examples of typical food products
 10 utilizing the shelf stable dairy product of the present invention are bakery products including pastries, danishes, bagels, turnovers, doughnuts and toaster strudel.

Working Examples

The following working examples serve to illustrate, but
 15 not limit the composition and method of this invention.

Working Examples 1-5 show various exemplary cream cheese compositions formulated in accordance with the invention.

WORKING EXAMPLE 1

20	<u>Ingredient</u>	<u>%</u>
	Cream Cheese	71.88
	High Fructose Corn Syrup	11.14
	Glycerine	5.00
	Salt	.40
25	Sucrose	8.93
	Potassium Sorbate	0.10
	Citric Acid	0.35
	Gum Blends	0.15
	Carboxymethyl Cellulose	0.30
30	Dried Cream Cheese	0.00
	Modified Corn Starch Ultrasperse	<u>1.75</u>
	from National Company	
		100.00

WORKING EXAMPLE 2

	<u>Ingredient</u>	<u>%</u>
5	Cream Cheese	61.88
	High Fructose Corn Syrup	11.14
	Glycerine	5.00
	Salt	.40
10	Sucrose	13.93
	Potassium Sorbate	.10
	Citric Acid	.35
	Gum Blends	.15
	Carboxymethyl Cellulose	.30
15	Dried Cream Cheese	5.00
	Modified Corn Starch Ultrasperse	<u>1.75</u>
	from National Company	
		100.00

20 WORKING EXAMPLE 3

	<u>Ingredient</u>	<u>%</u>
	Cream Cheese	51.88
25	High Fructose Corn Syrup	16.14
	Glycerine	5.00
	Salt	0.40
	Sucrose	13.93
	Potassium Sorbate	0.10
30	Citric Acid	0.35
	Gum Blends	0.15
	Carboxymethyl Cellulose	0.30
	Dried Cream Cheese	10.00
	Modified Corn Starch Ultrasperse	<u>1.75</u>
35	from National Company	
		100.00

WORKING EXAMPLE 4

	<u>Ingredient</u>	<u>%</u>
5	Cream Cheese	63.75
	High Fructose Corn Syrup	15.30
	Glycerine	5.00
	Salt	.40
10	Sucrose	8.83
	Potassium Sorbate	.10
	Citric Acid	.35
	Gum Blends	.15
	Carboxymethyl Cellulose	.30
15	Dried Cream Cheese	4.07
	Modified Corn Starch Ultrasperse	<u>1.75</u>
	from National Company	
		100.00

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WORKING EXAMPLE 5

	<u>Ingredient</u>	<u>%</u>
25	Cream Cheese	63.75
	High Fructose Corn Syrup	19.47
	Glycerine	5.00
	Salt	0.40
	Sucrose	8.83
30	Potassium Sorbate	0.10
	Citric Acid	0.35
	Gum Blends	0.15
	Carboxymethyl Cellulose	0.20
	Modified Corn Starch Ultrasperse	<u>1.75</u>
35	from National Company	
		100.00

Shelf Stability

40 In accordance with the invention, a cream cheese filling comprising about 64% cream cheese, about 19% high fructose corn syrup, about 5% glycerol, about 0.6% salt, about 9.4% sucrose, about 0.35% citric acid, about 0.15% of a gum blend, about 1% modified corn starch and about 0.1%

potassium sorbate as a preservative was inoculated with staphylococcus aureus and salmonella at 25°C and 32°C. The cream cheese samples were tested regularly for eight weeks. The study showed that there was no regular yeast or regular
5 mold growth at 25°C or 32°C. Additionally, there was no recovery of the staphylococcus aureus and salmonella organisms after 3 days. The initial plate count remained static throughout the eight weeks of the study. These results demonstrate that the cream cheese filling is shelf
10 stable at 25°C and 32°C for 8 weeks.

While the invention has been specifically described by reference to various embodiments, it will be recognized that various modifications, adaptations and variations, may be made without departing from the spirit and scope of the
15 invention as defined by the following claims.

WE CLAIM:

1. A shelf stable dairy product comprising:
 - (a) a dairy product
 - (b) an amount of a freezing point depressant
 - 5 effective to lower A_w to less than about 0.91; and
 - (c) water.
2. The shelf stable dairy product of claim 1 further comprising an effective preserving amount of a
10 preservative.
3. The shelf stable dairy product of claim 1 further comprising an acidulant in an amount effective to lower the pH level to about 2 to 5.
15
4. The shelf stable dairy product of claim 3 wherein the acidulant is selected from the group consisting of phosphoric acid, sulfuric acid, adipic acid, tartaric acid, succinic acid, acetic acid, fumaric acid, propionic acid,
20 citric acid, malic acid, lactic acid, and mixtures thereof.
5. The shelf stable dairy product of claim 1 wherein the dairy product is selected from the group consisting of milk, buttermilk, cheese, cream cheese, butter, ice cream
25 and mixtures thereof.

6. The shelf stable dairy product of claim 1 wherein the dairy product comprises cream cheese.

7. The shelf stable dairy product of claim 1 further comprising a physical stabilizer.

8. The shelf stable dairy product of claim 7 wherein the physical stabilizer comprises a cellulose compound, said cellulose compound selected from the group consisting of a cellulose compound, a cellulose derivative and mixtures thereof.

9. The shelf stable dairy product of claim 7 wherein the physical stabilizer comprises a cellulose compound selected from the group consisting of carboxymethyl cellulose, carboxyethyl cellulose, carboxypropyl cellulose, and mixtures thereof.

10. The shelf stable dairy product of claim 7 further comprising a physical stabilizer selected from the group consisting of a starch, xanthan gum, locust bean gum, guar gum and mixtures thereof.

11. The shelf stable dairy product of claim 6 wherein said dairy product comprises cream cheese containing less than about 55% water by weight.

12. The shelf stable dairy product of claim 1 wherein the freezing point depressant comprises a humectant.

5 13. The shelf stable dairy product of claim 12 wherein the humectant is selected from the group consisting of an alcohol, a saccharide, a gum, a salt and mixtures thereof.

14. The shelf stable dairy product of claim 12 wherein
10 the humectant is selected from the group consisting of glycerol, sucrose, fructose, glucose, propylene glycol, sodium chloride, sorbitol, mannitol, polydextrose, carboxymethyl cellulose, guar gum, molasses, potassium
polymetaphosphate, triacetin, propionate, sodium lactate,
15 monosodium glutamate, corn syrup, glycine, 1,2-propanediol, alginate, and mixtures thereof.

15. The shelf stable dairy product of claim 6 wherein the shelf stable dairy product has at least 50% by weight
20 cream cheese and about 2 to 10% by weight glycerine.

16. A food product comprising the composition of claim 1.

25 17. A shelf stable cheese comprising:

(a) about 20 to 70% by weight of a cheese;

- (b) about 25 to 65% by weight of a humectant;
- (c) about 2 to 8% by weight of a physical stabilizer; and
- (d) water.

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18. The shelf stable cream cheese of claim 17 further comprising about 0.07 to 0.25% by weight of a preservative and an acidulant to adjust the pH level to about 2 to 5.

10 19. The shelf stable cheese of claim 17 wherein the A_w is between about 0.75 to 0.91.

20' 20. The shelf stable cheese of claim 17 wherein the A_w is about 0.80 to 0.89.

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21. The shelf stable cheese of claim 18 wherein the pH level is about 3 to 4.5.

22. The shelf stable cheese of claim 18 wherein the
20 acidulant is selected from the group consisting of phosphoric acid, sulfuric acid, adipic acid, tartaric acid, succinic acid, acetic acid, fumaric acid, propionic acid, citric acid, malic acid, lactic acid and mixtures thereof.

25 23. The shelf stable cheese of claim 17 wherein the cheese comprises a cream cheese.

24. The shelf stable cheese of claim 17 wherein the physical stabilizer comprises:

5 (i) about 0.1 to 0.5% by weight of a cellulose compound; and

(ii) about 1.5 to 7.9% by weight of one or more stabilizers selected from the group consisting of starch, xanthan gum, guar gum, and locust bean gum wherein the % by weight is based on the total weight of the
10 shelf stable cheese.

25. The shelf stable cheese of claim 17 wherein the humectant is selected from the group consisting of an alcohol, a saccharide, a gum, a salt and mixtures thereof.

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26. The shelf stable cheese of claim 17 wherein the humectant is selected from the group consisting of glycerol, sucrose, fructose, glucose, propylene glycol, sodium chloride, sorbitol, mannitol, polydextrose,
20 carboxymethyl cellulose, guar gum, molasses, potassium polymetaphosphate, triacetin, propionate, sodium lactate, monosodium glutamate, corn syrup, glycine, 1,2-propanediol, alginate, and mixtures thereof.

25 27. The shelf stable cheese of claim 17 wherein the humectant comprises less than 1% by weight of a salt.

28. A shelf stable cream cheese comprising:

(a) about 50-70% by weight of a cream cheese;

(b) about 29 to 50% by weight of a humectant

5 wherein the humectant comprises about 2 to 10% by weight glycerine to lower A_w to about 0.82 to 0.86;

(c) about 0.1 to 0.2% by weight of a preservative selected from the group consisting of potassium sorbate, sorbic acid and mixtures thereof;

10 (d) about 2.0 to 5.0% by weight of a physical stabilizer comprising:

(i) about 0.1 to 0.5% by weight of carboxymethyl cellulose; and

15 (ii) about 1.5 to 4.9% by weight of one or more of the stabilizers selected from the group consisting of starch, xanthan gum, locust bean gum and guar gum;

(e) about 0.20 to 0.45% by weight of an acidulant to adjust the pH level to about 3 to 4; and

20 (f) water.

29. The shelf stable cream cheese of claim 28 wherein the humectant comprises:

(a) about 10 - 47.6% by weight fructose;

25 (b) about 2 - 10% by weight glycerine;

(c) about 0.4 - 2.0% by weight salt; and

(d) about 0 - 37.6% by weight sucrose wherein the weight % is based on the total weight of the shelf stable cream cheese.

5 30. A method of preserving a dairy product comprising mixing a dairy product with an amount of a freezing point depressant effective to lower A_w to less than about 0.91.

31. The method of claim 30 further comprising mixing
10 the dairy product with an effective preserving amount of a preservative and an acidulant to lower the pH to about 2 to 5.

32. The method of claim 30 wherein the freezing point
15 depressant comprises about 2 to 10% by weight glycerine based on the total weight of the shelf stable cream cheese.

33. The method of claim 30 further comprising
contacting the cream cheese with a physical stabilizer
20 comprising about 0.1 to 0.5% by weight of a cellulose compound, based on the total weight of the shelf stable cream cheese.

INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/US 94/08730

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A23C19/076 A23C19/09 A23C19/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 246 197 (BATELLE MEMORIAL INSTITUTE) 19 November 1987 see page 2, line 49 - page 3, line 25; claims 1-3 --- -/--	1,2,5,7, 10, 12-14, 16,30

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

14 December 1994

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INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/US 94/08730

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>DATABASE FSTA INTERNATIONAL FOOD INFORMATION SERVICE (IFIS), FRANKFURT/MAIN, DE 86-01-p0054 1986, D. SCHMIDT 'Microbiological and sensory characteristics of a home style confectionary product prepared with cream cheese' see abstract & JOURNAL OF FOOD QUALITY, vol.7, no.4, 1985 pages 283 - 288</p> <p>---</p>	1,5,6, 11-14, 16,30
X	<p>ANNALES DE LA NUTRITION ET DE L'ALIMENTATION, vol.32, no.2-3, 1978 pages 597 - 615 C. CHEFTEL ET AL. 'Aliments à humidité intermédiaire: gels polysaccharidiques et protéiques' see page 600 see page 610 - page 613</p> <p>---</p>	1,3-5,7, 10, 12-14, 17,19, 20,26, 30,32
X	<p>JOURNAL OF FOOD SCIENCE, vol.43, no.1, 1978, CHICAGO US pages 341 - 344 L. KREISMAN ET AL. 'Storage stability of intermediate moisture food process cheese food products' see page 341, column 1 - page 342, column 2; tables 1,2</p> <p>---</p>	1,2,5, 12,15,30
X	<p>US,A,4 244 977 (M. KANN ET AL.) 13 January 1981</p> <p>see column 10 - column 12; claims 1-13; example</p> <p>---</p>	1,2,5,7, 9,10, 12-14, 16,30
X	<p>WO,A,92 08361 (MARS INC.) 29 May 1992</p> <p>see claim 1; examples 6-8</p> <p>---</p>	1,3-7, 11-14, 17,19, 23,30,31
A	<p>GB,A,2 032 241 (KRAFT INC.) 8 May 1980</p> <p>see claims 1-7; examples 6,7</p> <p>---</p>	1-7, 10-18, 21-23, 25,26

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INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/US 94/08730

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>PATENT ABSTRACTS OF JAPAN vol. 12, no. 491 (C-554) & JP,A,63 202 339 (SNOW BRAND MILK PROD CO) see abstract</p> <p>-----</p>	30,33

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